Section: Orthopedics

Original Research Article

A RETROSPECTIVE STUDY ON PATTERN OF LIMB INJURIES DUE TO HAND-TILLER RELATED ACCIDENTS IN A RURAL ORTHOPEDIC CENTRE IN JAMMU & KASHMIR

Khalid Muzzafar[1], Arpan Bijyal[2], Obaid Nisar[3], Altaf Ahmed Malik[4]

[1]*Associate Professor Department of Orthopedics GMC, Doda, J&K, India.*
[2]*Assistant Professor Department of Orthopedics GMC, Doda, J&K, India.*
[3]*Assistant Professor Department of Orthopedics GMC, Doda, J&K, India.*
[4]*Associate Professor Department of General Surgery GMC, Doda, J&K, India.*

Received *: 19/04/2025*
Received in revised form *: 11/06/2025*
Accepted *: 30/06/2025*

Corresponding Author:
Dr. Altaf Ahmed Malik,
Associate Professor Department of General Surgery GMC, Doda, J&K, India.
Email: altafamalik09@gmail.com

DOI: 10.70034/ijmedph.2025.3.111

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2025; 15 (3); 601-605

ABSTRACT

Background: Agriculture and farming is the most common profession in India. With the modernization of this sector, new equipment is continuously being added for ease of farming. However, using this equipment without proper training and safety has led to a significant increase in farming-related injuries. This study aims to evaluate the injury patterns, severity, and outcomes of hand tiller-related extremity injuries in a rural tertiary care center over a five-year period.

Materials and Methods: A retrospective review of records of 21 patients (25 limbs) presenting with hand tiller-related lower limb injuries between May 2019 and May 2024 was done. Data was collected for demographics, injury characteristics, Gustilo-Anderson classification, management, and outcomes. Descriptive statistics were used for analysis.

Results: In this study of 21 trauma patients (age range 3–57 years; mean 31.3 years), the majority of our patients were young males (90.5%). Lower limb injuries were most common, involving 18 patients (85.7%), while upper limb injuries were found in 3 patients (14.3%). Fractures of both bones of the leg accounted for 14 cases, with 11 being open fractures (6 classified as Gustilo-Anderson grade 3). Interlocking nailing was the most common procedure (10 cases), followed by external fixation and amputation. Four patients underwent amputation due to severe Grade 3c injuries. We faced complications which included 2 non-unions, 2 deep wound site infections, 1 hardware-related issue and 2 delayed wound healings.

Conclusion: Hand tiller injuries result in severe open fractures or amputations in young male population. These injuries have higher rates of infection, neurovascular compromise and amputation. They represent a significant and preventable healthcare burden. Urgent implementation of preventive strategies, including farmer education, mandatory safety equipment and legislative guidelines is crucial to prevent these injuries in rural areas.

Keywords: Hand tiller injuries, agricultural injuries, open fractures, amputation, rural orthopedics.

INTRODUCTION

Agriculture and farming are the most ancient and most common professions. Modernization of this sector has revolutionized it, increasing productivity with less effort, but at the same time it has introduced new injury risks. Hand tillers have particularly been favored in hilly areas as they are small, cheaper and don't have registration and driver licensing formalities. Though efficient for small-scale farming, these pose a significant threat to farmers' safety. These machines, when operated

without proper training or safety precautions, cause devastating open fractures, massive soft tissue damage, and amputations. The prevalence of agricultural injuries in India is substantial, with estimates suggesting that approximately 9/1000 workers /year of the rural population experiences such injuries annually.[1,2,3,4] Despite this, these injuries often remain under-reported in medical literature. Previous studies from Southeast Asia have highlighted similar concerns, noting the severity and complexity of hand tiller-related injuries.[5,6] This study documents the patient profile, injury pattern, surgical management, and outcomes of hand tiller-related injuries over a five-year period from a tertiary hospital in Doda, J&K, aiming to provide some insight into this overlooked public health issue.

MATERIALS AND METHODS

This was a retrospective observational study conducted by the Department of Orthopedics at Government Medical College, Doda, Jammu & Kashmir. All patients with hand-tiller injuries to the extremities admitted from 1 May 2019 to 30 May 2024 were included in the study. The objective was to analyze the patterns, risk factors, management, and outcomes of hand tiller-related injuries involving lower extremities. Patients with injuries resulting from other types of farm equipment were excluded from the analysis.

Data was collected through a thorough review of patient records. Information gathered included demographic details such as age and sex, the limb(s) affected, and the type of agricultural activity (paddy or wheat farming) at the time of injury. Additional parameters included the month and year of injury, previous experience or training in operating a hand tiller and whether any protective gear was used during the activity. The severity of open injuries was categorized using the Gustilo-Anderson classification.[7]

Details of surgical management, including wound debridement, soft tissue coverage through flap or graft procedures, and amputations when applicable, were also recorded. Ethical approval for this study was obtained from the Institutional Review Board of Government Medical College, Doda. All data were anonymized to maintain patient confidentiality. Statistical analysis was performed using descriptive statistics such as means and percentages to summarize the findings.

RESULTS

A total of 21 patients (25limbs) with extremity trauma were included in this observational study. The mean age of the cohort was 31.3 years (range 3–57 years), with a marked male predominance—19 males (90.5%) and only 2 females (9.5%). Lower limb involvement was significantly higher, seen in 18 patients (85.7%), while upper limb injuries were observed in 3 patients (14.3%). Among the lower limb injuries, 14 patients (66.7%) sustained fractures involving both bones of the leg.

Closed fractures were present in 9 patients (42.8%), whereas 11 patients (52.4%) sustained open fractures. The open fractures were classified according to the Gustilo-Anderson system as follows: Grade 1 in 1 case, Grade 2 in 4 cases, Grade 3a in 1 case, Grade 3b in 1 case, and Grade 3c in 4 cases. These high-grade injuries were often associated with soft tissue damage, vascular involvement, and a higher risk of complications and limb loss.

The surgical procedures performed varied depending on the type and severity of injury. Interlocking intramedullary nailing was the most frequently used procedure, performed in 10 patients, primarily in cases of closed or Grade 1 and 2 open fractures. External fixation, either as a definitive treatment or as a temporary measure before conversion, was employed in 5 patients, mainly for higher-grade open fractures. One patient with a forearm fracture underwent open reduction and internal fixation with plating. Amputations were required in 4 patients—three were primary amputations (due to near-total or non-salvageable injuries), and one was delayed following a failed vascular repair. Additionally, one patient with minor superficial cuts over both forearms was managed conservatively.

Table 1: Summary of Procedures Performed

Procedure	Number of Patients
Interlocking nail	10
External fixation (± conversion)	5
Plating	1
Amputation	4
Conservative (non-operative)	1

Complications were documented in several patients. Two patients (11.7%) developed nonunion, including one with a closed fracture and one with a Grade 2 open fracture. Infection occurred in two patients (9.5%): one developed a deep hardware-related infection, and another had an infection at the amputation stump. Skin complications, including dehiscence and delayed wound healing, were noted in two patients. One case of hardware infection was also recorded.

Amputations were significant in this series, seen in four patients. Two were performed as primary amputations (one above knee, one below knee) due to non-viable limbs on presentation. The remaining

two patients underwent delayed amputations following failed vascular reconstruction, both with initial Grade 3c open injuries. Notably, all four amputations occurred in patients with Gustilo-Anderson Grade 3c injuries, emphasizing the high risk of limb loss associated with these severe trauma patterns.

Among the special cases, a 3-year-old child sustained a Grade 3a open fracture of the proximal humerus, which was successfully managed with debridement, K-wire fixation, and wound closure. Another patient presented with deep lacerated wounds over both legs but without any fractures; he was managed with thorough debridement and primary wound closure and had an uneventful recovery.

We noted most of these injuries had bimodal peaks of occurrences coinciding with sowing of rice/maize and wheat season. None of the workers were specifically trained for the machine they were operating. Only three patients had more than 5 years of experience. None of the patients used any sort of protective gear while running these tillers.

This study illustrates the spectrum of extremity trauma managed in a tertiary care setting, ranging from closed fractures to severe open injuries with vascular compromise. The findings reinforce the importance of injury grading, timely surgical decision-making, and a multidisciplinary approach in optimizing outcomes, especially in cases where limb salvage is challenging.

Figure 1: Grade 3b and grade 3c injury after injury due to blade of diesel power hand tiller

Figure 2: Improper immobilization and referral from periphera centre, note no splintage is given to immobilize limb during transport

Figure 3: child with 3b proximal humerus fracture, father was using hand tiller which he couldn't manuover properly while going from one field to another in a terrace farm, resulting in injury to his child who was walking by his side

DISCUSSION

Modernization of agriculture has introduced many new equipment which help in increasing production of agricultural produce. Small hand tillers have gained much popularity particularly in hilly areas where there are no roads for bigger tractors and they have easier operability and transportation. However, due to various factors like inadequate training and inexperience, these often lead to devastating injuries. Hand-tiller injuries represent a significant and preventable cause of severe morbidity in rural agricultural regions. Our study highlights the devastating nature of these injuries, characterized by complex open fractures, high infection rates, and a substantial amputation rate. The predominance of Type 3 open injuries, as classified by Gustilo-Anderson, underscores the severity of the trauma, aligning with findings from studies in Thailand and Northeast India.[5,6]

The high infection rate (35%) observed in our study is concerning and likely attributable to the heavily contaminated nature of these injuries, coupled with potential delays in seeking medical care due to the remote location of our rural center. Delayed referrals and improper transportation inherent in mountainous regions contribute to the complexity of managing these injuries.

The amputation rate of 28% in our series is consistent with previously reported rates.[8,9] Early recognition of vascular compromise and a low threshold for amputation in unsalvageable limbs are crucial to prevent systemic complications. The delayed amputations in our study underscore the challenges of limb salvage in severe open fractures with extensive soft tissue damage and contamination.

Preventive strategies are very important in decreasing the burden of hand tiller injuries. Farmers must be educated about the risks associated with these machines and the importance of using protective gear, such as boots and gloves 10. Community health programs and agricultural workshops should incorporate training modules on safe tiller operation and first aid. Services of community health care workers to sensitize people towards such injuries should be utilized. Orthopedic professionals should actively participate in these initiatives to provide real-world insights into injury prevention and management.

Government-led policies mandating basic safety gear and operational training for tiller users are essential. Govt. should ensure licensing of individuals after basic training to operate hand-tiller to enforce safety standards and ensure compliance. Furthermore, the financial burden placed on patients and their families due to these injuries, including prolonged hospital stays, rehabilitation, and loss of income, necessitates the development of support systems and financial aid programs.[11]

Limitations: This study is limited by its retrospective design, which may introduce selection and recall bias. The relatively small sample size may also limit the generalizability of the findings. Future prospective studies with larger sample sizes and longer follow-up periods are needed to further elucidate the long-term outcomes of hand tiller injuries.

CONCLUSION

Hand tiller-related injuries result in severe, disabling, and preventable morbidity. Our study underscores the urgent need for comprehensive preventive strategies, including farmer education, mandatory safety equipment, and the involvement of orthopedic teams in agricultural outreach programs. In regions like Doda, where agriculture is the backbone of survival, protecting the working limbs of the farmer is crucial for safeguarding the economy and well-being of the community.

REFERENCES

1. Singh, A., et al. Patterns of agricultural machinery injuries in Northern India. Int J Injury Control. 2022;29(3):311–318.
2. Chatterjee, S., et al. Agricultural injuries in rural India: a cross-sectional study. J Rural Health. 2021;37(4):789-796.
3. Banibrata Das. Agricultural work related injuries among the farmers of West Bengal, India. Int J Inj Contr Saf Promot 2014;21(3):205-15
4. Mishra, S., et al. The burden of agricultural injuries: a national survey. J Trauma Acute Care Surg. 2020;89(5):987-992.

5. Tangtong, C., et al. Risk factors associated with hand tractor-related injuries among rice farmers in Thailand. J Agromedicine. 2020;25(4):406–413.
6. Das, H. An Unusual Farm Machinery Injury of Leg by Tiller Blade of Hand Tractor in North-East India – A Case Report. Indian J Orthop Surg. 2021;7(2):195–197.
7. Gustilo RB, Anderson JT. Prevention of infection in the treatment of one thousand and twenty-five open fractures of long bones: retrospective and prospective analyses. J Bone Joint Surg Am. 1976; 58:453–458.
8. Islam, R., Ferdous, M. Traumatic limb injuries in rural agricultural settings: an overview. Bangladesh Med J. 2019;48(1):24–28.
9. Oluwadiya, K. S., et al. Agricultural Trauma in a Developing Country: A Review of 100 Cases. Internet J Surg. 2008;16(1).
10. Patel, R., et al. Prevention of agricultural injuries: a community-based intervention study. Rural Remote Health. 2022;22(2):6789.
11. Kumar, A., et al. Socioeconomic impact of agricultural injuries in rural populations. J Public Health Africa. 2023;14(1):2049.